Appendix 2. A Review of Rhode Island's Aquaculture Industry

a) Historical Overview
b) Current Practices
c) Marine Biotechnology

a) Historical Overview Rhode Island is home to more than one hundred fresh water ponds and salt water beaches, and includes over four hundred miles of coastline. The dominant feature of the coastline is Narragansett Bay, an inlet of the Atlantic Ocean, that extends into eastern Rhode Island and is an estuary for Rhode Island's major rivers – the Woonasquatucket River, the Moshassuck River, the Seekonk River, the Blackstone River and the Providence River. The state's fresh and salt water resources have always supported diverse commercial and recreational activities, and today, the marine and aquatic industry continues to draw on these natural resources to support commercial fishing, aquatic farming and a variety of research and educational activities.

Rhode Island's Legislature has always been a champion of the state's natural water resources and coastal areas. In 1864 the Legislature voted to lease parcels of Narragansett Bay for private shellfish cultivation. Within 40 years of this enactment, 21,000 acres of the Bay were being farmed for the production of oysters. The state's industry was successful for many years— producing 15 million pounds of oysters annually at its height and employing more than 1,500 workers. Oyster farming in the Bay declined dramatically in the 1930's and eventually the oyster beds became non-productive. While there is no one conclusive explanation for the demise of the beds it is speculated that several factors (both natural and man-made) contributed to the loss of the state's thriving oyster industry. Rhode Island's oyster business was virtually eliminated by the 1940's, but the Bay still supported a commercial harvest of natural-set quahogs from the waters that had previously yielded oysters. The continuance of the private, yet unproductive oyster leases into the 1950's created stress between commercial fishermen and the aquaculture companies, resulting in a series of confrontations known as the *Oyster Wars*. Ultimately, the State reacted with the large-scale retraction of those private leases.

In the 1960's, a growing demand for seafood and heightened public awareness of the fragile nature of the coastal environment renewed interest in alternate methods of growing and harvesting aquatic products. In Rhode Island, the importance of our coastal resources and the substantial social and economic value they possess was being recognized. As a consequence, the Rhode Island General Assembly created the Coastal Resources Management Council (CRMC) in 1971 as the organization responsible for preserving the state's natural coastal resources. The mandate of the CRMC is . . . "to preserve, protect, develop, and restore the coastal resources of the state." The CRMC is responsible for a broad range of planning and management (policies, regulations, etc.) for the state's coastal area. It interacts with all relevant local, state and federal agencies and seeks input from the public via regular hearings on initiatives that affect the coast. In addition, the CRMC has authority over aquaculture permitting.

b) Current Practices In 1995, the Rhode Island Legislative Commission on Aquaculture was established by House Resolution 95-H 5615 Substitute A to "…promote, protect, and stimulate aquacultural commerce in Rhode Island." Chaired by Representative Eileen Naughton, a tireless advocate of aquaculture in Rhode Island, the Commission consisted of representation from the House of Representatives; the state's Economic Development Corporation, the Department of Environmental Management, the Department of Administration, the University of Rhode Island, the state's aquaculture industry and several members of the general public. The end product of the Commission, released in February 1998, was the compilation of "A Strategic Plan for Rhode Island Aquaculture". The Commission (1) addressed potential benefits and opportunities related

to aquaculture development; (2) identified existing or potential constraints to aquaculture development that would need to be addressed and resolved; (3) outlined potential steps to promote and sustain aquaculture in the state; (4) identified potential sources of assistance—economic and regulatory personnel, aquaculture industry resources as well as educational and research sources; and (5) compiled a three-tier set of recommendations that encompass:

- the promotion of Rhode Island's aquaculture industry,
- the coordination of the state's lands and waters with existing uses
- the efficient use of the state's limited natural resource base.

The principles that guided the Commission were as follows:

1. Aquaculture development should be a priority in Rhode Island's management of its natural and economic resources and should be given specific policy and developmental considerations.
2. Aquaculture should be a private sector initiative. The principle responsibility for commercial development should rest with the industry.
3. Aquaculture is a legitimate use of land and water resources. It deserves equitable access to state resources.
4. Aquaculture development should be driven by competitive market forces, not centrally managed by state agencies.
5. Aquaculture development should be consistent with government responsibilities, including public health and safety, navigation, and environmental protection.
6. Aquaculture is a form of agriculture, and should be subject to similar regulations.
7. Coordination of state and local policies is critical to successful aquaculture development.
8. A viable supply and service sector is an essential industry component.
9. Research and development and technology transfer are prerequisites for industry development.
10. An appropriately trained workforce is essential to aquaculture development.

The final set of Commission recommendations, developed as a result of numerous meetings with aquaculture experts; review of strategic plans authored by other states; review of a wide range of materials related to the aquaculture industry (regulatory issues, economic impact, aquaculture practices, etc.); and discussions with a broad array of professionals from regulatory agencies, the educational community, and the private sector are listed below:

Primary Recommendations:

1. Appropriate statutes should be amended to specifically recognize aquaculture as a form of agriculture, so that aquaculture ventures may receive the same regulatory stature and benefits afforded to other agricultural operations.
2. The Rhode Island General Assembly should designate a single Lead Agency to oversee aquaculture permitting and regulation.
3. The designated Lead Agency, together with the Rhode Island General Assembly and local communities, should develop an aquaculture zoning plan for Rhode Island waters.
4. The Rhode Island General Assembly and the designated Lead Agency should work to streamline regulations applicable to aquaculture.

Secondary Recommendations:

1. The Lead Agency should develop legislation and regulations to ensure that aquaculture promotes efficient use of the state's natural resources and complies with efforts to ensure high quality water.
2. The Lead Agency, in cooperation with colleges, universities, and primary/secondary schools, should work to expand aquaculture education and training in the state.
3. The Lead Agency, together with local communities and private organizations, should work to expand the use of aquaculture for the enhancement of depleted natural finfish and shellfish stocks.
4. The Lead Agency should work to revise existing state and federal regulations that hinder interstate commerce in aquaculture products.

Supplemental Recommendations:

Through the combined efforts of government agencies and research institutions, fact finding, analysis, and specific actions should be identified, compiled and utilized to:

1. Improve marketing of Rhode Island aquaculture products and expand financial programs available to aquaculture ventures, and
2. Promote advanced research that will position Rhode Island as a leader in aquaculture technology and development.

In order to address and implement the recommendations developed by the Legislative Commission on Aquaculture, the Commission turned to the Coastal Resources Management Council (CRMC). It designated the CRMC as the Lead Agency to work with the various constituencies (public and private) to accomplish the objectives set forth in the Strategic Plan that was made available to the Rhode Island public in 1998.

Building on the foundation established in 1971 to protect the state's coastal resources, the CRMC initiated efforts to develop and expand Rhode Island's aquaculture activity and strengthen the economic well-being of the state. While CRMC's involvement has resulted in numerous activities, some of the recent achievements include:

- Creating and staffing an Aquaculture Coordinator position with responsibility for managing all issues relating to aquaculture policies and permitting;
- Initiating a Memorandum of Agreement with Rhode Island's Department of Environmental Management, Division of Agriculture to coordinate and facilitate upland aquaculture permitting for agriculture interests.
- Forming a working group on biointegrity that draws upon the knowledge and experience of persons from the aquaculture industry, regulatory agencies, and academia from Rhode Island as well as from the neighboring states of Connecticut and Massachusetts with the intent to share relevant information and address issues such as aquaculture disease, invasive species and other issues that relate to and affect the region's aquaculture industry.
- Creating a second working group focused solely on improving regulatory matters. Tasks range from better understanding how regulations affect local industry to developing better channels of communication between traditional fishing communities and the emerging aquaculture industry on such central issues as limits on lease size and location.

- Creating three new permit categories: (1) to allow an aquaculturist to "test" a site to determine its potential; (2) a renewable permit specific to research entities and (3) with specific qualifications, a permit to allow the use of upwellers in recreational docks. Additionally, the CRMC continued to work to streamline and make more efficient the entire permitting process.
- Initiating a mapping project to chart usage of the state's water resources to reduce and avoid potential conflicts between traditional users, aquaculture sites and any other development related to Rhode Island's water resources.
- Developing of a forum (New England Aquaculture Conference) for academic and industry practitioners (based on the annual Rhode Island Aquaculture Conference) expanded to include Rhode Island, Connecticut, Massachusetts, and New York.
- Beginning to analyze how the aquaculture industry and related entities impact the state's economy. Evaluation includes dollars generated by distributors of cultured food products, by manufacturers and suppliers of industry products, by educational and research institutions, etc. and encompassed not only those monies directly related to the production and sale of aquacultured goods but the ripple effect that the industry ultimately has on the state's revenues (personnel payroll, undergraduate/graduate tuition, non-state grant funds funneled to the state's research and academic institutions, etc.).

These achievements have occurred with the assistance and cooperation of the aquaculture industry, commercial fishermen and members of Rhode Island's academic community. Two of the state's institutions of higher education (Roger Williams University and the University of Rhode Island) contribute to aquaculture through research and course offerings at the undergraduate and graduate level. More specifically, the state's aquaculture and ancillary businesses benefit directly from the opportunity to work with expert faculty and researchers on issues such as disease, production technology and market trends—to name a few. This technical assistance is essential to helping Rhode Island's aquaculture industry grow and compete regionally and globally. In addition to the direct benefits derived by aquaculture from academic resources, research efforts contribute significantly to the state's business community and provides products and services to aquaculturists well beyond the boundaries of Rhode Island.

Today, the state's aquaculture industry has identified specific niche markets for their particular product lines and have developed successful distribution channels for their products and services. Though still small, with ongoing access to technical assistance (research, development, business planning, marketing, etc.) from the academic community and the communication and knowledge imparted through extension specialists and conferences, these businesses are poised to meet the needs of the expanding worldwide aquaculture industry and compete nationally and globally.

c) Marine Biotechnology Marine biotechnology, as noted in the *Introduction* to this document, is a fast growing sector of the aquatic industry. The state of Rhode Island, drawing upon its water resources, its network of marine researchers and with support from the state's various governmental and economic development entities, has an opportunity to become a major player in this field. Current research is targeted to increase aquaculture production and provide consistently higher quality product while minimizing financial risk factors associated with production. Such studies include improving reproduction and growth rates, developing disease resistant strains; vaccines and treatments to protect cultured species, etc.

Although marine biotechnology is still in its infancy, research has already contributed to such medically significant breakthroughs as the development of hydroxyapatite (HA) from coral for use as an implant into certain human bone fractures; the development of the osteoporosis drugs (Calcimar and Miacalcin), originally derived from salmon calcitonin but now synthetically manufactured; numerous uses of chitin, found in crab and shrimp shells and used as a polymer in skin replacement for burn victims and even weight-loss products. Other promising marine biotechnology research being conducted is focused on development of cancer fighting drugs, potential antibiotics, and the development of materials that have the potential to speed the healing of wounds and prevent scarring.

Other exciting research relates to marine and environmental problems. For example, evaluating marine organisms for potential use as land-based pesticides, or for use as biomonitors (sensors, indicators, diagnostic devices, etc.) and for the development of biodegradable polymers. Locally, faculty at several of Rhode Island's educational institutions are extensively involved in marine biotechnolgy research. For example, studies are currently underway that seek to identify marine organisms that could be used to develop products to prevent biofouling and still other research is focused on identification of various marine bacteria that feed on aquatic pollutants.

Rhode Island already possesses two important components necessary to capitalize on the expanding marine biotechnology research field -- access to water resources and a talented pool of marine biotechnology researchers. The missing element to position the state to become a significant contributor to the field of marine biotechnology research is an incubation facility that provides researchers, start-ups, spin-offs and established marine biotechnology businesses with wet/dry lab space in which to conduct their research and development.